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PHENOLOGY SATELLITE EXPERIMENT

ERTS-1 Proposal No. MMC 159

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Progress Report for Period 8/08/73 - 10/08/73

Accomplishments during this reporting period include:

A. The collection, filing and evaluation of ground observation photography and MSS imagery for all corridors continued.

ERTS-1 positive transparencies for the summer and fall 1972 were received from NASA in August. Classification of these positive transparencies is being made as to total percent of sky covered by clouds and the degree of clarity of each of the ten experimental areas.

B. The Welsh Densicron density analyzer was modified to make measurements on areas less than was possible using the standard aperture. In addition, regression equations were derived for calibration of the instrument and gray scale anomalies on the MSS imagery. Preliminary analysis of one site indicates that density changes are directly related to phenological changes and these correlations are also evident using the

$$\text{band-to-band ratio} = \frac{\text{Density Band 5} - \text{Density Band 7}}{\text{Density Band 5} + \text{Density Band 7}}$$

Work is now underway to derive a correction procedure for the measured density involving sun angle and atmospheric differences.

C. A new format for displaying the results of the analysis has been adopted. The peak relative spectral response for a given channel is plotted against the date of overpass. The graphs show this temporal plot for each channel individually.

A linear regression analysis was then performed for all test sites having four or more analyzed fall dates. The following points were made:

- 1) Higher correlation coefficients were found in bands 6 and 7.
- 2) The slopes were negative in all four bands (channels). This suggests the possibility that the correction factor is important in that a decrease in actual albedo at all wavelengths is unlikely for the forested areas being studied.

A graphic and statistical comparison was also made between peak relative spectral response and latitude for three given dates. The following observations were made from these results:

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C. (Continued)

- 1) Correlation coefficients were somewhat higher in bands 4 and 5 (in contrast to the above findings for spectral response versus time).
- 2) Significance of the correlation coefficients was easier to obtain in bands 4 and 5.
- 3) Regression slopes are consistently negative for bands 4 and 5 while positive for 6 and 7.
- 4) The regression slopes tend to become consistently "flatter" as the Brown Wave progresses. This effect is observed in all four bands.

A data exchange method has been adopted in order to coordinate the efforts of the imagery interpretation groups and the computer analysis group for the final phase of the project.

D. The following Brown Wave data for 1972 has been analyzed:

W. Virginia	20 Aug, 7 Sept
N. Carolina	30 Oct
Texas (Central)	16 Dec
Snowville, UT	7 Aug, 12 Sept, 30 Sept
Colo. City, AZ	30 Sept

We are still awaiting the last tapes ordered for the Brown Wave. Within a week after these arrive we expect to have the initial analysis for the 1972 Brown Wave completed.

Green Wave data tapes received and analyzed so far include:

Vermont	7 Apr, 25 Apr
Pennsylvania	10 Jan, 23 Mar, 16 May
W. Virginia	11 Jan, 24 Mar
N. Carolina	23 Mar, 10 Apr, 16 May
Lafayette, IN	16 Jan, 4 Feb, 5 May, 9 Jun
S. Indiana	16 Jan, 4 Feb, 22 Feb, 9 Jun
Missouri	14 Mar
Oklahoma	9 Feb, 17 Mar, 22 Apr, 10 May
Texas (North)	16 Mar, 9 May
Texas (Central)	3 Jan, 16 Mar, 9 May
Havre, MT	12 Mar, 30 Mar, 5 May, 23 May, 10 Jun

E. Plant species surveys of all 10 rangeland sites is underway to determine: (1) the species of plants present, (2) percentage of ground covered by each species, and (3) the relative predominance of each species. These surveys are being made from on-site inspection and by viewing 35mm colored slides of the rangeland site.

E. (Continued)

Classification of all 30 observation sites as to percent of the ground covered by vegetation is being kept up-dated as film arrives from the field. Preliminary comparisons of these data with other phenological information received from throughout the Western Region is in progress.

A world map indicating "Average Annual Evapotranspiration (inches)" after the Solar Thermal Unit Method has been completed. Also, the "Potential Average Number of Alfalfa Cuttings Per Year" has been mapped for the world.

Analysis of the ground-truth photographs from 30 sub-sites is continuing to determine the timing and percentage of ground cover affected by the greening process in spring and the browning process in the fall. This data will be compared with similar data from the ERTS satellite.

Preliminary maps have been completed to indicate the timing at which 95% of the leaves have turned brown (in the fall) for Arnold Red Honeysuckle, Zabeli Honeysuckle, and Common Purple Lilac.

Publications or Papers

No publications or papers reported during this period.

Modification of Contract/Order No. NAS 5-21781 was received during this period for the purpose of extending the period of performance of Phase III until 8 February 1974. This modification was issued without additional funds.

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